PN-ACA-456

COLD CHAIN AND LOGISTICS FOR POLIO NATIONAL IMMUNISATION DAYS IN NEPAL

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ACRONYMS

BASICS	Basic Support for Institutionalizing Child Survival
EPI	Expanded Programme on Immunization
MOH	Ministry of Health
NIDs	National Immunization Days
OPV	Oral Polio Vaccine
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VVMs	Vaccine Vial Monitors
WHO	World Health Organization

1. INTRODUCTION

Polio national immunisation says (NIDs) are planned for 6 December 1996 and 17 January 1997, with at least two additional annual NIDs to follow through to 2000 A.D.

It is intended to provide a single dose of two drops of oral polio vaccine (OPV) to all children under-5-years of age in each NID. The target population has been estimated at 3.3 million children under the age of 5.

To assist in the preparation for Nepal's NIDs, this consultant conducted a rapid assessment survey of the vaccine cold chain at national, regional, district, and immunization outlet levels of the system using a standardised protocol (WHO TECHNET 1992). The national vaccine stores, two regional vaccine stores, five district stores, and three immunization providers were visited. While the facilities sample was not randomised, the findings can be considered as indicative[1] of the range of problems encountered and the recommendations applicable to His Majesties' Government's immunization program.

A review of equipment and supplies on order for the routine immunization program as well as for the national immunization days was carried out with the cooperation of both UNICEF/Kathmandu and WHO/Nepal. An equipment inventory study in one region conducted by a national UNICEF consultant[2] was reviewed.

2. NIDS AND ROUTINE EPI

While the quality of the vaccine cold chain is very weak in the routine immunisation program, the *fast chain* approach of the NIDs will minimise the worst of these problems.

The major constraints seen which have serious implications for the NIDs are the shortages of ice packs and ice pack or ice freezing capacity. While new equipment is on order, much of the existing stock of equipment could be repaired and brought into use. Insufficient ice packs for routine operations were found at five of six districts visited.

While 34,000 icepacks have been ordered by UNICEF for the NIDs, an additional 65,000 would solve many of the operational problems—though not without training, as the use of ice packs is poorly understood at all levels.

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1 The frequency of similar problems found and the commonality of training, equipment, and supervision would suggest that the problems identified are common within the program.

2 Mr. Amir Man Shrestra, UNICEF consultant, conducted a cold chain inventory study in 1995. The findings of this study were broadly consistent with the findings of the BASICS consultant.

2.1. Ice Pack Usage

In the facilities visited, ice packs were primarily stored unfilled and were not available for use. Few ice packs were stored in refrigerator freezers or in chest freezers for use in vaccine transport or refrigerator temperature stability[3]. Vaccine carriers and vaccine transport boxes returned from the field contained an inadequate number of ice packs for safe vaccine transport. The returned ice packs were not immediately refrozen, but left at room temperature until they were required, at which time they were put into the freezer.

The large quantities of ice packs without caps and anecdotal data suggests that ice packs are used for drinking water bottles.

3. VACCINE REQUIREMENTS

NID vaccine requirements, in addition to routine immunisation, have been estimated and requests submitted to donors. At the present time, the vaccine deliveries are expected to reach the national vaccine stores in Kathmandu in sufficient time for pre-NID distribution.

REQUIRED ORAL POLIO VACCINE STORAGE VOLUME AT REGIONS						
REGION		Total	Population < age 5		Vaccine	25%
CENTRAL	6,930,440	1,108,870	2,217,741	554,435	2,772,176	2,689
WESTERN	4,173,657	667,785	1,335,570	333,893	1,669,463	1,736
MID-WESTERN	2,683,754	429,401	858,801	214,700	1,073,502	1,116
FAR-WESTERN	1,876,134	300,181	600,363	151,291	751,654	782
EASTERN	4,923,969	787,835	1,575,670	397,069	1,972,739	2,052
TOTALS	20,587,954	3,294,073	6,588,145	1,651,388	8,239,534	8,375

A total of 10,674,800 doses of OPV are being provided by UNICEF, US/CDC, and Rotary International in phased deliveries during the period 15 July 1996 through 18 November 1996.

Recommendation: The Rotary International vaccine delivery scheduled for 18 November should be delayed until after 6 December 1996.

[3] Ice packs stored in the freezer helps keep the refrigerator or freezer cold during power or fuel outages and improve the temperature stability of the equipment used for vaccine storage.

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4. VACCINE LOGISTICS SYSTEM

Vaccines arrive in Kathmandu at the international airport and are collected for delivery to the national EPI vaccine stores at the Ministry of Health's Logistics Management Division. Vaccines arrive in the appropriate packaging as specified in the WHO/UNICEF Guidelines for International Shipments of Vaccines (1987 Rev).

In the national vaccine stores, vaccines are unloaded into a 65 cubic metre walk-in freezer (-20°C) or a 35 cubic metre walk-in cold room (+2°C to +8°C), as appropriate for the vaccine. Oral polio vaccine may be stored at +2°C to +8°C[4] for 6 to 12 months, while for long-term storage -20°C is recommended[5].

A review of all vaccine deliveries scheduled for the period of July 1996 through April 1997 was carried out to verify the adequacy of central-level vaccine storage capacity. At its maximum, approximately 26 cubic metres of vaccine (including inner packaging materials) will be stored at this level. This is equivalent to about 33 percent of the total volume of the cold storage equipment and is well within recommended loading rates (40 percent). To achieve this, OPV will need to be stored at either temperature range.

> Recommendation: Oral polio vaccine should be stored at +2ºC to +8ºC for up to six months, or at -20ºC in national vaccine stores used for the NIDs.

It had been proposed that vaccines would be transhipped to regional stores on arrival at the airport in Kathmandu. This is a poor practice and should not be implemented. On arrival, vaccines must be transported to the national vaccine stores, unloaded into the walk-in freezer and walk-in cold room, inspected, and a vaccine arrival report[6] completed.

Before any further shipment, the vaccines must be repacked in insulated vaccine transport boxes with frozen ice packs. Advance notification to the destination vaccine stores must be given.

> Recommendation: Vaccines should not be transhipped to regions directly on arrival. Vaccines must be transported to the national vaccine stores, unloaded into the walk-in freezer and walk-in cold room, inspected, and a vaccine arrival report completed.

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4 WHO EPI *Stability of Vaccines*, 47, WHO/EPI/GEN/89.8.

5 Manufacturer's recommendations.

6 See Appendix A, WHO/UNICEF Vaccine Arrival Report Form.

4.1. Regional Stores

In general, vaccines are shipped from the national vaccine stores to the five regional vaccine stores. Each regional store is equipped with an 18 cubic metre volume cold room (+2°C to +8°C) and between three and six working freezers (-20°C). At least one cold room, while maintaining correct temperatures, was operating on one of two refrigeration units and is, therefore, unreliable. While generators for emergency back-up are available and await installation, none have been installed during the last two years.

It is estimated that the vaccine storage capacity is sufficient if OPV is stored at both temperatures.

Recommendation: Oral polio vaccine should be stored at +2ºC to +8ºC for up to three months or at -20ºC in regional vaccine stores used for the NIDs.

Recommendation: Existing diesel generators should be installed on a simple concrete slab with a sheet metal, lean-to roof rather than awaiting the funding and construction of a generator building.

4.2. District Stores

Nepal has 75 districts. In general, each district-level vaccine store visited had three to seven freezers, one or two refrigerators, and one or two ice pack freezers. In some facilities visited, about 50 percent of the equipment was operating; the remainder required repair. While vaccine storage capacity is seen to be adequate, there are serious constraints on ice pack freezing capacity.

The existing freezers which are out of order must be repaired. In the Eastern Region, five freezers were repaired locally by UNICEF for Rs.11,000, under US$200.

Many vaccine carriers and vaccine transport boxes are damaged and need replacement.

Insufficient ice packs for routine operations were found at five of six districts visited. Even in the facility with enough ice packs for the scheduled routine EPI operations, there were too few to support the NIDs. Each freezer should hold between 300 and 500 ice packs. Additional stock should be held to replace those in use for outreach and those damaged in the normal operation of the cold chain.

Recommendation: Additional ice packs should be provided to all facilities using refrigerators and freezers. It is estimated that each freezer should have 500 ice packs provided, and each refrigerator should have 40 ice packs.

Inventory information is incomplete at the national level and information on equipment requirements must be gathered as part of the NID planning. An inventory control form[7] was provided to district health officers for this purpose.

Recommendation: A cold chain inventory must be made and inoperable equipment must be repaired regionally/locally or replaced from national stocks as new equipment arrives.

4.3. Health Facilities

Few immunization service providers were visited. In three where refrigerators were used, the refrigerators were between +9 °C and 11 °C. In a facility operating on a vaccine carrier, the vaccine temperature was estimated to be around 15 °C.

Even in facilities with refrigerators, vaccines for day or sessional use should be stored in vaccine carriers, preferably with a foam pad in the neck to protect the vaccines and extend the cold life of the equipment. Opening the refrigerator for each dose or vial of vaccine ensures elevated storage temperatures.

At the facilities visited, insufficient ice packs were available for proper and safe operation of the vaccine cold chain.

Recommendation: All health facilities providing routine immunisation services require at least two vaccine carriers, foam pads, and sufficient ice packs for safe operation. For each vaccine carrier, three sets of ice packs are required. For each refrigerator, 50 ice packs are required; for each freezer, 500 ice packs are required. It should be expected that ice pack losses will be between 20 percent to 25 percent, annually.

4.4. Outreach Immunisation Posts

In the one operating outreach immunisation post visited, the cold chain was inadequate and vaccines were warm—some 15 hours after the vaccines were received.

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[7] See Appendix H.

Temporary NID vaccine carriers constructed of double wall, corrugated cardboard and lined with water resistant paper have been developed and tested. Used with 2400 ml icepacks and without opening, they provide about six hours of vaccine safe storage at the expected 24°C ambient temperature. These should be used in outreach settings where ice packs or ice in plastic bags are available, and are only appropriate for the national immunization days where vaccine is stored for a very short time at this level.

Recommendation: For routine service delivery, outreach immunisation posts without refrigerators should use at least two vaccine carriers—one for icepacks and vaccines and one for ice packs. Foam pads should be provided with each vaccine carrier to ensure a longer cold life.

4.5. Equipment Requirements and Distribution

It is not clear that the current distribution list for equipment donated under the NIDs is based on actual need. Unless additional funds are rapidly available, the international delivery of refrigerators and freezers will be delayed until shortly before or soon after the first NID.

Informal discussions were held with the USAID project providing logistics support training to the MOH's Logistics Management Division. If approved by USAID, the project's staff would provide limited training in distribution planning. This assistance appears to be within the objective of the project.

Recommendation: The final distribution list and plans for equipment distribution should be made after receiving the completed logistics and inventory forms from each district.

4.6. Repair and Maintenance

Estimates of the quantities of inoperable and repairable cold chain equipment are given above.

Recommendation: Repairable refrigerators and freezers should be repaired locally, using regional private sector refrigeration companies.

5. VACCINE MANAGEMENT

Vaccine management appeared reasonable at the national and regional levels. Stock records were maintained better in the districts than at the central level. At all levels, there are problems with thermometers, automatic temperature recorders, and over-temperature alarms, where installed.

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6. SUPERVISION AND TRAINING

Supervision has been very limited, infrequent, and appears not to be technical or training based.

Some training in the vaccine cold chain has been conducted in the last year by UNICEF; however, many EPI supervisor posts and cold chain assistant posts are vacant. Where these positions were not filled, no staff were trained.

> Recommendation: Two staff of any designation at each health facility should be officially responsible for vaccines and their storage. They must then receive in-service training annually as part of their training. Routine field supervision must take place from the national, regional, and district levels, with a focus on problem solving and training.

7. QUALITY ASSURANCE AND VVMS

Limited training on vaccine vial monitors (VVMs) was carried out by the WHO and BASICS consultant team. Materials based on WHO/EPI materials were developed in the field, and translated and were made available for district-level training. Activity planning forms were provided to facilitate district level NID planning[8]. This training was piloted in one region and will be replicated in each of the country's five regions during August through September 1996 by the Ministry of Health, assisted by WHO and UNICEF.

A data collection form[9] to gather information on the effect of the use of VVMs for both delivered vaccine quality and vaccine wastage has been developed for use at the district level at this stage.

> Recommendation: The information gathered on VVMs and vaccine quality and wastage should be analysed between rounds of the NIDs so that additional interventions in vaccine management may be implemented in the following round.

8. RECOMMENDATIONS

The Rotary International vaccine delivery scheduled for 18 November should be delayed until after 6 December 1996. (MOH/WHO)

Oral polio vaccine should be stored at +2°C to +8°C or at -20°C in vaccine stores used for the NIDs. (MOH)

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[8] See Appendix I.

[9] See Annex 5.

Vaccines should not be transhipped directly on arrival. Vaccines must be transported to the national vaccine stores, unloaded into the walk-in freezer and walk-in cold room, inspected, and a vaccine arrival report completed. (MOH/WHO)

Oral polio vaccine should be stored at +2°C to +8°C for up to three months or at -20°C in regional vaccine stores used for the NIDs. (MOH)

Existing diesel generators should be installed on a simple concrete slab with a sheet metal, lean-to roof rather than awaiting the funding and construction of a generator building. (MOH)

Additional ice packs should be provided to all facilities using refrigerators and freezers. It is estimated that each freezer should have 500 ice packs provided and each refrigerator should have 40 ice packs. (MOH/UNICEF)

A cold chain inventory must be made and out-of-order equipment must be repaired locally or replaced from national stocks as new equipment arrives. (MOH)

All health facilities providing routine immunisation services require at least two vaccine carriers, foam pads, and sufficient ice packs for safe operation. For each vaccine carrier, three sets of four ice packs are required. Fore each refrigerator, 50 ice packs are required, and for each freezer 500 ice packs are required. It should be expected that ice pack losses will be between 20 to 25 percent, annually. (MOH/donors)

For routine service delivery outreach immunisation posts without refrigerators should use at least two vaccine carriers—one for icepacks and vaccines and one for ice packs. Foam pads should be provided with each vaccine carrier to ensure a longer holdover time. (MOH/UNICEF)

The final distribution list and plans for equipment distribution should be made after receiving the completed logistics and inventory forms from each district. (MOH)

Repairable refrigerators and freezers should be repaired locally using private sector refrigeration companies. (MOH/UNICEF)

Two staff of any designation at each health facility should be officially responsible for vaccines and their storage. They must then receive in-service training annually as part of other training. Routine field supervision must take place from the national, regional, and district levels, with a focus on problem solving and training. (MOH)

The information gathered on VVMs and vaccine quality and wastage should be analysed between rounds of the NIDs so that additional interventions in vaccine management may be implemented in the following round. (MOH/WHO/USAID-BASICS)

APPENDIXES

APPENDIX A

VACCINE ARRIVAL REPORT FORM
WHO/UNICEF

B

VACCINE ARRIVAL REPORT

FLIGHT DETAILS:

AIRPORT INFORMATION		DATE AND TIME		
		Arrival	Departure	Flight No.
ORIGIN				
STOPOVER				
FINAL				
SUPPLIER				

VACCINES:

VACCINE	MANUFACTURER	NUMBER OF VIALS	DOSES PER VIAL	LOT NUMBER	EXPIRY DATE

DILUENT:

VACCINE	MANUFACTURER	NUMBER OF VIALS	DOSES PER VIAL	LOT NUMBER	EXPIRY DATE

ARE VIAL MONITORS ATTACHED	YES	NO

IS AIRWAY BILL ATTACHED?	YES	NO
IS PACKING LIST ATTACHED?	YES	NO

SHIPPING PROCEDURES:

WAS ADVANCE FAX RECEIVED? (DATE?)	
WAS IT SENT TO THE CORRECT ADDRESS?	
WHO WAS IT SENT BY?	
WERE THERE DIFFERENCES BETWEEN THE FAXED INFORMATION AND THE ACTUAL ARRIVAL? WHAT?	

COLD CHAIN MONITOR:

HOW MANY IN EACH BOX?				
VACCINE				
INDEX	A B C D	A B C D	A B C D	A B C D
DATE OF PACKING				
DATE OF ARRIVAL				

DPT,DT,Td, AND TT SHIPPING INDICATORS:

WERE THE TT SHIPPING INDICATORS INCLUDED?	YES	NO
WAS THE DOT BLACK ?	YES	NO

VACCINE ARRIVAL REPORT

VACCINE TRANSPORT BOXES.

TOTAL NUMBER OF BOXES?	

IS THE CARGO PROPERLY LABELLED?	YES	NO
IS THE TELEPHONE NUMBER OF THE CONSIGNEE ON THE CARGO?	YES	NO
DOES THE LABEL STATE " STORE VACCINES AT 0°C TO 8°C"?	YES	NO
DOES THE LABEL STATE " DO NOT FREEZE"? (IF DPT, DT, Td, or TT VACCINES)	YES	NO
WERE THE PACKAGES LABELLED "VACCINE RUSH"?	YES	NO
WERE THE PACKAGES LABELLED "CONTAINS VACCINE"?	YES	NO

WHAT WAS THE STATE OF THE PACKAGE ON ARRIVAL?

NAME:	DATE:	SIGNATURE:

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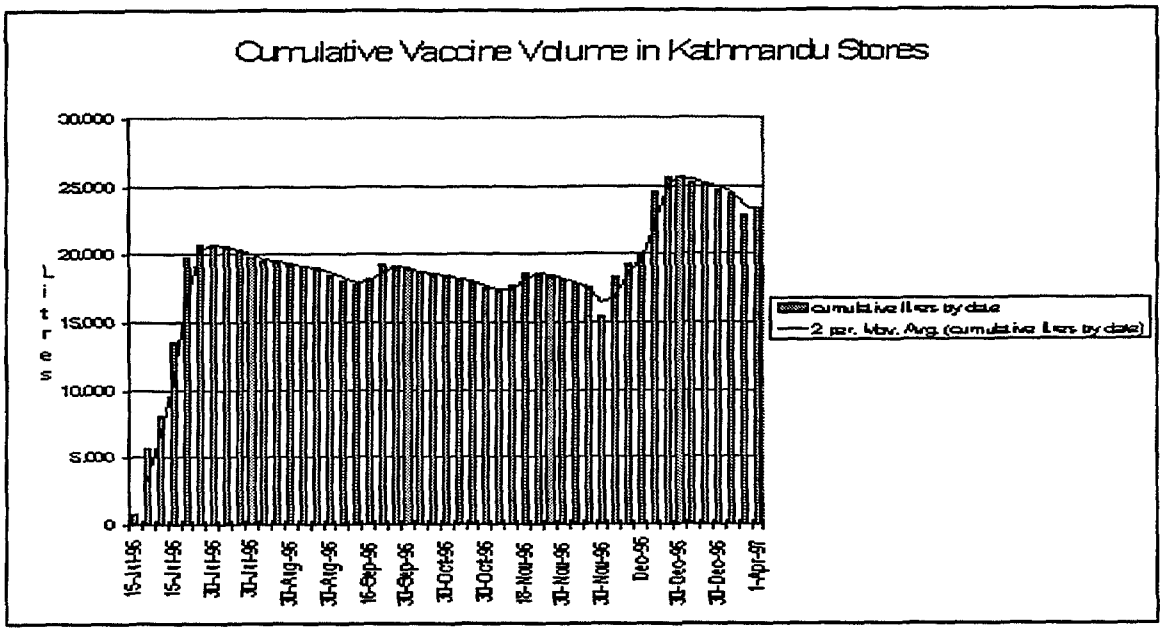
APPENDIX B

VACCINE STORAGE VOLUMES
15 JULY 1996 THROUGH 1 APRIL 1997

VACCINE STORAGE VOLUMES 15 JULY 1996 THROUGH 1 APRIL 1997									
Notes: Action or *Received from SUPLIER*	Date of Action	Vaccine	doses/vial	vials	volume vial + packaging (cm3)	total volume Litres	cumulative litres by date	Doses	
Stock	15-Jul-96	BCG	20	108,360	7.5	813	813		
Stock	15-Jul-96	DPT	10	308,500	16	4,936	5,749		
Stock	15-Jul-96	Measles	10	143,942	16	2,303	8,052		
Stock	15-Jul-96	OPV	10	264,400	20.8	5,500	13,552	2,644,000	
Stock	15-Jul-96	TT	10	386,200	16	6,179	19,731		
UNICEF	22-Jul-96	OPV	20	48,750	20.8	1,014	20,745	975,000	
issued	30-Jul-96	BCG	20	-8,080	7.5	-61	20,684		
issued	30-Jul-96	DPT	10	-18,675	16	-299	20,385		
issued	30-Jul-96	Measles	10	-9,130	16	-146	20,239		
issued	30-Jul-96	OPV	10	-20,367	20.8	-424	19,815		
issued	30-Jul-96	TT	10	-16,297	16	-261	19,554		
issued	30-Aug-96	BCG	20	-8,080	7.5	-61	19,493		
issued	30-Aug-96	DPT	10	-18,675	16	-299	19,194		
issued	30-Aug-96	Measles	10	-9,130	16	-146	19,048		
issued	30-Aug-96	Measles	10	-9,130	16	-146	18,902		
issued	30-Aug-96	OPV	10	-20,367	20.8	-424	18,478		
issued	30-Aug-96	OPV	10	-20,367	20.8	-424	18,054		
issued	30-Aug-96	TT	10	-16,297	16	-261	17,793		
UNICEF	16-Sep-96	BCG	20	45,750	7.5	343	18,136		
UNICEF	16-Sep-96	OPV	20	50,000	20.8	1,040	19,176	1,000,000	
issued	30-Sep-96	BCG	20	-8,080	7.5	-61	19,115		
issued	30-Sep-96	DPT	10	-18,675	16	-299	18,816		
issued	30-Sep-96	Measles	10	-9,130	16	-146	18,670		
issued	30-Sep-96	TT	10	-16,297	16	-261	18,409		
issued	30-Oct-96	BCG	20	-8,080	7.5	-61	18,348		
issued	30-Oct-96	DPT	10	-18,675	16	-299	18,049		
issued	30-Oct-96	Measles	10	-9,130	16	-146	17,903		
issued	30-Oct-96	OPV	10	-20,367	20.8	-424	17,479		
issued	30-Oct-96	TT	10	-16,297	16	-261	17,218		
UNICEF	18-Nov-96	BCG	20	50,000	7.5	375	17,593		
UNICEF	18-Nov-96	OPV	10	50,000	20.8	1,040	18,633	500,000	
issued	30-Nov-96	BCG	20	-8,080	7.5	-61	18,572		
issued	30-Nov-96	DPT	10	-18,675	16	-299	18,273		
issued	30-Nov-96	Measles	10	-9,130	16	-146	18,127		
issued	30-Nov-96	OPV	10	-20,367	20.8	-424	17,703		
issued	30-Nov-96	TT	10	-16,297	16	-261	17,442		
issued	30-Nov-96	OPV	20	-98,000	20.8	-2,038	15,404		
GoN	Dec-96	DPT	10	50,000	16	800	18,242		
GoN	Dec-96	Measles	10	63,644	16	1,018	19,260		
GoN	Dec-96	TT	10	35,000	16	560	19,820		
Rotary	15-Dec-96	OPV	20	226,065	20.8	4,702	24,522	4,521,300	
Rotary	15-Dec-96	OPV	20	51,725	20.8	1,076	25,598	1,034,500	
issued	30-Dec-96	BCG	20	-8,080	7.5	-61	25,537		Total all OPV
issued	30-Dec-96	DPT	10	-18,675	16	-299	25,238		10,674,800

VACCINE STORAGE CAPACITY AND AVERAGE MONTHLY ISSUE					
Average Monthly Issue Estimates (May-July96)					
number of months	dpt	opv	bcg	tt	measles
3	56,025	61,100	24,240	48,890	27,390
1	18,675	20,367	8,080	16,297	9,130
			cold room capacity Cu Mt +4C	Walk in Freezer	
		gross	70	65	
		Net	28	39	
		liters	28,000	39,000	



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ORAL POLIO VACCINE STORAGE VOLUME AT REGIONS FOR TWO NATIONAL IMMUNIZATION DAYS						
REGION	Total Population	Population < age 5	Vaccine Requirement	25% Wastage	Totals	Storage Volume Litres
CENTRAL	6,930,440	1,108,870	2,217,741	554,435	2,772,176	2,689
WESTERN	4,173,657	667,785	1,335,570	333,893	1,669,463	1,736
MID-WESTERN	2,683,754	429,401	858,801	214,700	1,073,502	1,116
FAR-WESTERN	1,876,134	300,181	600,363	151,291	751,654	782
EASTERN	4,923,969	787,835	1,575,670	397,069	1,972,739	2,052
TOTALS	20,587,954	3,294,073	6,588,145	1,651,388	8,239,534	8375

APPENDIX C

VACCINE STORAGE REQUIREMENTS BY REGION AND DISTRICTS

ORAL POLIO VACCINE STORAGE VOLUME AT DISTRICTS						
Central Region						
District	Total Population	Population <age 5	Vaccine Requirement	25% Wastage	Totals	Storage Volume Litres
Bara	467,229	74,757	149,513	37,378	186,892	0
Bhaktapur	191,337	30,614	61,228	15,307	76,535	80
Chitwan	401,373	64,220	128,439	32,110	160,549	167
Dhading	306,491	49,039	98,077	24,519	122,596	128
Dhanusa	606,786	97,086	194,172	48,543	242,714	252
Dolkha	190,682	30,509	61,018	15,255	76,273	79
Kathmandu	785,800	125,728	251,456	62,864	314,320	327
Kavre	352,164	56,346	112,692	28,173	140,866	147
Lalitpur	288,112	46,098	92,196	23,049	115,245	120
Mahottari	487,965	78,074	156,149	39,037	195,186	203
Makawanpur	352,911	56,466	112,932	28,233	141,164	147
Nuwakot	269,913	43,186	86,372	21,593	107,965	112
Parsa	419,116	67,059	134,117	33,529	167,646	174
Ramechhap	206,456	33,033	66,066	16,516	82,582	86
Rasuwa	40,778	6,524	13,049	3,262	16,311	17
Rautahat	461,446	73,831	147,663	36,916	184,578	192
Sarlahi	568,628	90,980	181,961	45,490	227,451	237
Sindhuli	248,425	39,748	79,496	19,874	99,370	103
Sindhupalchowk	284,828	45,572	91,145	22,786	113,931	118
Regional Total	6,930,440	1,108,870	2,217,741	554,435	2,772,176	2,689

ORAL POLIO VACCINE STORAGE VOLUME AT DISTRICTS						
Western Region						
District	Total Population	Population <age 5	Vaccine Requirement	25% Wastage	Totals	Storage Volume
Arghakhanchi	197,929	31,669	63,337	15,834	79,172	82
Baglung	251,896	40,303	80,607	20,152	100,758	105
Gorkha	272,343	43,575	87,150	21,787	108,937	113
Gulmi	290,225	46,436	92,872	23,218	116,090	121
Kapilvastu	421,614	67,458	134,916	33,729	168,646	175
Kaski	329,487	52,718	105,436	26,359	131,795	137
Lamjung	164,562	26,330	52,660	13,165	65,825	68
Manang	5,470	875	1,750	438	2,188	2
Mustang	15,589	2,494	4,988	1,247	6,236	6
Myadi	108,106	17,297	34,594	8,648	43,242	45
Nawalparasi	496,721	79,475	158,951	39,738	198,688	207
Palpa	256,939	41,110	82,220	20,555	102,776	107
Parbat	156,511	25,042	50,084	12,521	62,604	65
Rupendehi	592,123	94,740	189,479	47,370	236,849	246
Syangja	318,086	50,894	101,788	25,447	127,234	132
Tanahu	296,056	47,369	94,738	23,684	118,422	123
Regional Total	4,173,657	667,785	1,335,570	333,893	1,669,463	1,736

ORAL POLIO VACCINE STORAGE VOLUME AT DISTRICTS						
Mid-Western Region						
District	Total Population	Population <age 5	Vaccine Requirement	25% Wastage	Totals	Storage Volume
Banke	326,877	52,300	104,601	26,150	130,751	136
Bardiya	332,675	53,228	106,456	26,614	133,070	138
Dailekh	205,096	32,815	65,631	16,408	82,038	85
Dang	399,118	63,859	127,718	31,929	159,647	166
Dolpa	27,387	4,382	8,764	2,191	10,955	11
Humla	38,033	6,085	12,171	3,043	15,213	16
Jajarkot	125,000	20,000	40,000	10,000	50,000	52
Jumla	82,769	13,243	26,486	6,622	33,108	34
Kalikot	96,904	15,505	31,009	7,752	38,762	40
Mugu	39,136	6,262	12,524	3,131	15,654	16
Pyuthan	191,154	30,585	61,169	15,292	76,462	80
Rolpa	194,409	31,105	62,211	15,553	77,764	81
Rukum	171,326	27,412	54,824	13,706	68,530	71
Salyan	198,884	31,821	63,643	15,911	79,554	83
Surkhet	254,986	40,798	81,596	20,399	101,994	106
Regional Total	2,683,754	429,401	858,801	214,700	1,073,502	1,116

ORAL POLIO VACCINE STORAGE VOLUME AT DISTRICTS						
Far-Western Region						
District	Total Population	Population <age 5	Vaccine Requirement	25% Wastage	Totals	Storage Volume
Achham	213,920	34,227	68,454	17,251	85,705	89
Baitadi	218,653	34,984	69,969	17,632	87,601	91
Bajhang	151,559	24,249	48,499	12,222	60,721	63
Bajura	100,344	16,055	32,110	8,092	40,202	42
Darchula	110,945	17,751	35,502	8,947	44,449	46
Dadeldhura	115485	18,478	36,955	9,313	46,268	48
Doti	181,386	29,022	58,044	14,627	72,670	76
Kailali	486,771	77,883	155,767	39,253	195,020	203
Kanchanpur	297,071	47,531	95,063	23,956	119,019	124
Regional Total	1,876,134	300,181	600,363	151,291	751,654	782

ORAL POLIO VACCINE STORAGE VOLUME AT DISTRICTS						
Eastern Region						
District	Total Population	Population <age 5	Vaccine Requirement	25% Wastage	Totals	Storage Volume
Bhojpur	213,890	34,222	68,445	17,248	85,693	89
Dhankuta	160,127	25,620	51,241	12,913	64,153	67
Ilam	256,782	41,085	82,170	20,707	102,877	107
Jhapa	660,690	105,710	211,421	53,278	264,699	275
Khotang	231,740	37,078	74,157	18,688	92,844	97
Udorang	753,676	120,588	241,176	60,776	301,953	314
Okhaldhunga	149,633	23,941	47,883	12,066	59,949	62
Panchthar	192,038	30,726	61,452	15,486	76,938	80
Sankhuwasabha	154,431	24,709	49,418	12,453	61,871	64
Saptari	517,615	82,818	165,637	41,740	207,377	216
Siraha	512,124	81,940	163,880	41,298	205,177	213
Solukhumbu	105,876	16,940	33,880	8,538	42,418	44
Sunsari	523,561	83,770	167,540	42,220	209,759	218
Taplejung	128,359	20,537	41,075	10,351	51,426	53
Teharthum	112,251	17,960	35,920	9,052	44,972	47
Udaypur	251,176	40,188	80,376	20,255	100,631	105
Regional Total	4,923,969	787,835	1,575,670	397,069	1,972,739	2,052

APPENDIX D

VACCINE VIAL MONITOR
DATA COLLECTION FORM

VVM DATA COLLECTION FORM FOR USE AT DISTRICT LEVEL

No.	Name/Location of Health Post	>1 day travel from district cold store?	Is there ice or cold icepacks in the coldbox?	Total Number Of Vials Returned	Number of good vials (VVM = 1 or 2)	Number of bad vials (VVM = 3 or 4)
1		Yes / No	Yes / No			
2		Yes / No	Yes / No			
3		Yes / No	Yes / No			
4		Yes / No	Yes / No			
5		Yes / No	Yes / No			
6		Yes / No	Yes / No			
7		Yes / No	Yes / No			
8		Yes / No	Yes / No			
9		Yes / No	Yes / No			
10		Yes / No	Yes / No			
11		Yes / No	Yes / No			
12		Yes / No	Yes / No			
13		Yes / No	Yes / No			
14		Yes / No	Yes / No			
15		Yes / No	Yes / No			
16		Yes / No	Yes / No			
17		Yes / No	Yes / No			
18		Yes / No	Yes / No			
19		Yes / No	Yes / No			
20		Yes / No	Yes / No			
21		Yes / No	Yes / No			
22		Yes / No	Yes / No			
23		Yes / No	Yes / No			
24		Yes / No	Yes / No			
25		Yes / No	Yes / No			
			Total =			

NOTE: This is how to read the Vaccine Vial Monitor (VVM)

1 = good OPV **2 = good OPV** **3 = bad OPV** **4 = bad OPV**

APPENDIX E

MAP OF NEPAL SHOWING KNOWN ICE FACTORIES


NEPAL
NATIONAL
FAR-WESTERN REGION
MID-WESTERN REGION
WESTERN REGION
CENTRAL REGION
EASTERN REGION
CHINA
INDIA
KATHMANDU
LEGEND
INTERNATIONAL BOUNDARY
REGIONAL BOUNDARY
ZONAL BOUNDARY
DISTRICT BOUNDARY
ROAD (Metalled)
ROAD (Under Construction)
DISTRICT HQ
ICE FACTORY Locations
Scale: 1: 2,000,000
40 20 0 40 80 100 120 Kms.

APPENDIX F

NATIONAL IMMUNIZATION DAY
DAY CARRIER FOR OPV

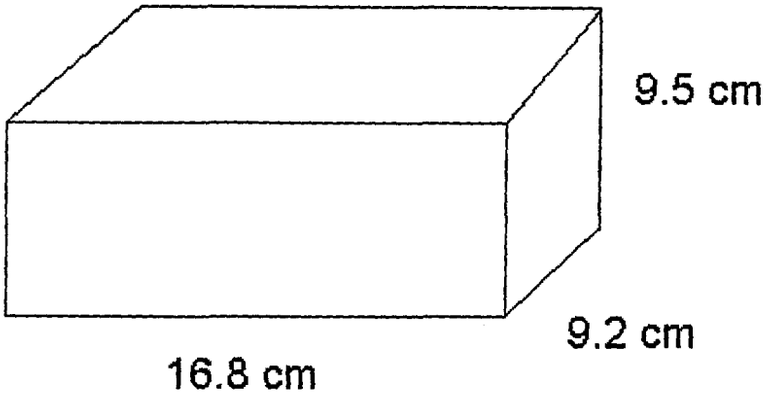
DAY CARRIER FOR POLIO NIDS

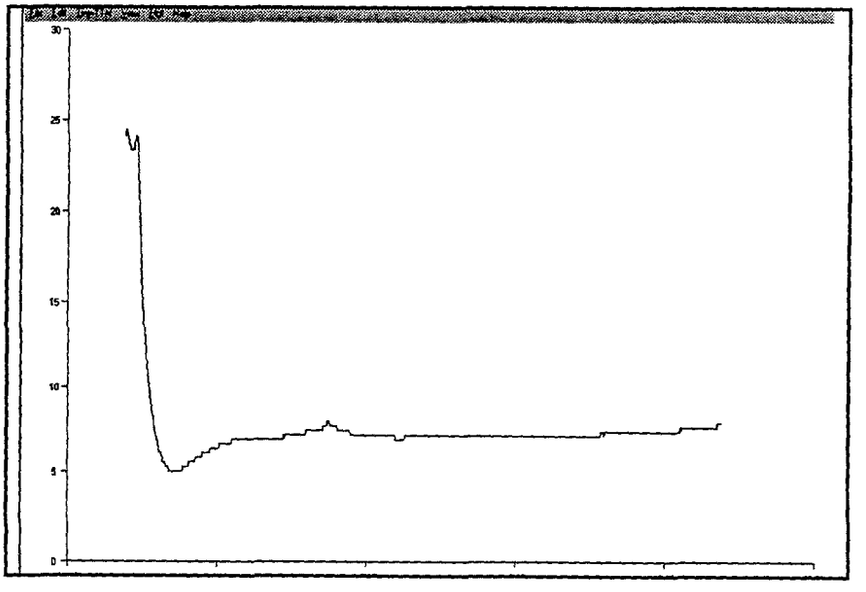
This day carrier is designed for use with two 400 CC. Ice packs (PIS E5/10 Quattro Elle Spa).

Internal dimensions
Length = 16.8 cm
height = 9.5 cm
width = 9.2 cm

The box shall be made from coated double wall heavy duty corrugated cardboard. All joins should be stapled.

The bottom fold shall be sealed and joined with a full sheet of waterproof coated paper, rising at least 4 cm on the inner walls, and fixed with waterproof glue. A folded tongue closure on the top of the box should be provided.





Temperature log at 23°C to 27°C ambient, day carrier with two 400 CC icepacks, without opening.

APPENDIX G

INVENTORY CONTROL FORM
GENERIC

INVENTORY CONTROL FORM

Page

ITEM DESCRIPTION:	
UNIT OF ISSUE:	
EXPIRY DATE	RE-ORDER POINT
LOT/BATCH NUMBER	
LOCATION	

DATE	RECEIVED FROM	ISSUED TO	QUANTITY	BALANCE
	Balance brought forward from page :			

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APPENDIX H

ACTIVITY PLANNING FORM
GENERIC

PLAN OF ACTION

PAGE of

PROGRAM AREA >>>

YEARS 19.. to 19..

OBJECTIVE	STRATEGY

ACTIVITIES RELATED TO THIS OBJECTIVE	ACTION OFFICER NAME	TIME-FRAME FROM TO	BUDGET COST ESTIMATE	PRIORITY	FUNDING SOURCE	WAS THE ACTIVITY COMPLETED YES? or NO?